Please add the following claim 15:

--15. The method as recited in claim 1, wherein said radiation frequencies are selected to distinguish one said constituent component from another said constituent component.--

REMARKS

The present response amends claims 1, 11, 12, 13 and 14 in conformity with the following remarks, and adds claim 15. Claims 1-15 remain in the application.

Applicants acknowledge the indication of drawing informality. Formal figures will be prepared and filed upon indication of allowable subject matter.

Applicants also note that the Information Disclosure Statement and references filed July 7, 1989, have apparently not yet been considered by the examiner. Careful consideration of this statement and references, and return of the signed form PTO-1449, are respectfully requested.

SECTION 102(a) AND (b) REJECTION

Claim 14 was rejected as unpatentable over the reference to Anderson et al. In light of the above amendments, this ground of rejection is respectfully traversed.

The reference to Anderson is directed to a method for estimating oxygen saturation in whole blood. More particularly, Anderson teaches an integrating sphere spectrophotometer used to measure the light-scattering properties of whole blood and to apply

those properties in measuring oxygen concentration. The integrating sphere shown in Fig. 1, page 176, is used to receive scattered light transmitted through sample depths of 110 to 710 micrometers (page 177). The sample chamber contains whole blood for which optical density can be obtained therefrom (page 178).

The apparatus and method taught in Anderson deals with calculating concentrations of total hemoglobin content (pages 175 and 178) and oxygenated hemoglobin (pages 177 and 178). Throughout the Anderson reference, mention is only made of total hemoglobin and oxygenated hemoglobin and measurement appears limited to only these two blood constituents.

In contrast, the present invention discloses a method and apparatus for calculating concentrations of at least three constituents of whole blood. The present application, therefore, can measure concentrations of at least three hemoglobin species (e.g., oxyhemoglobin, deoxyhemoglobin, carboyhemoglobin and methemoglobin). At most, Anderson teaches variation of no more than two hemoglobin derivatives: 1) total hemoglobin and 2) oxygenated hemoglobin (concentrations of oxyhemoglobin). One of the advantages of the claimed, present invention is that at least three constituents components (claims 1, 13 and 14) may be obtained at each of said radiation frequencies (claim 1). The radiation frequencies are optimally selected to maximize the measurement accuracy in distinguishing one hemoglobin species from another. Conversely, Anderson teaches selection of radiation frequencies

which optimally produce readings for total hemoglobin and oxygenated hemoglobin content.

In light of the claim amendments and above discussion, Applicants respectfully request the Examiner to withdraw the rejection of claim 14 under §102.

SECTION 103 REJECTION

Claims 1, 2 and 6-14 were rejected as obvious over Anderson et al. In light of the amended claims and added claim 15, this ground of rejection is respectfully traversed.

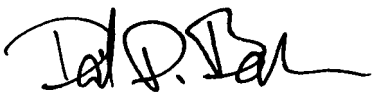
As mentioned in the Office Action, Anderson teaches using a set of four wavelengths, 505, 520, 530 and 560 nanometers, to minimize the effect of radiation scattering and maximize radiation absorbance. Absorbance is shown to have a linear relationship at specific wavelengths in Fig. 6. The linear relationship is useable in Anderson to calculate certain blood components such as e.g., oxygen saturation. Conversely, the present application can measure at least three constituents components of whole blood using a wavelength range that not only produces a higher radiation absorbance but which also maximizes the measurement accuracy in distinguishing one hemoglobin constituent component from another. Nowhere in Anderson is there mention of measuring at least three constituent components, and nowhere does Anderson suggest choosing measurement wavelengths which can measure and distinguish three or more components.

Claims 3 through 5 were also rejected as obvious over Anderson et al. in view of Shiboto. Claims 3-5 are respectfully asserted to be patentable for the same reasons presented above with respect to claim 1, and for the additional detail recited therein.

CONCLUSION

In the present amendment, Applicants have addressed the rejections in the Office Action based on §102 and §103. Further, in view of the added claim, the amendments to the claims, and applicants' remarks traversing the rejections, applicants believe that claims 1-15 are in condition for allowance. According, the present response is believed to be a complete response to the Office Action and full reconsideration is requested. Claim 1-15 appear to be in condition for allowance and such favorable action is respectfully requested.

Respectfully submitted,



David D. Bahler
Reg. No. 30,932

ARNOLD, WHITE & DURKEE
P. O. Box 4433
Houston, Texas 77210
(512) 320-7200

Dated: July 3, 1990

g:\utsk\097\pto\01.daf